

REMARKS

Claims 1-3, 6-9, 11, 12, 14, 16-20, and 33-50 were pending. Claims 1-3, 6-9, 11, 12, 14, 16-20, 34, 36, 38-42, and 46 have been amended. Claim 51 has been added. No new matter has been introduced. Claims 33, 35, 36, 43-45, and 47-50 have been canceled. Claims 1-3, 6-9, 11, 12, 14, 16-20, 34, 36, 38-42, 46, and 51 are currently pending.

Claims 1-3, 6-9, 11, 12, 14, 16-20 and 33-50 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Amagai (U.S. Patent No. 6,232,661) in combination with Forray (U.S. Pub. No. 2002/0062923). The rejection is respectfully traversed.

The claimed invention relates to a prepackaged semiconductor device assembly in which a die is adhesively attached to a solder mask. The adhesive layer is only partially cured. The assembly can be wire bonded, encapsulated, solder reflowed, and tested as the adhesive, though partially cured, is sufficient to hold the die to the solder mask. *See* Present Specification at 7. The prepackaged semiconductor device assembly can later be packaged, e.g., encapsulated, and the adhesive can be fully cured when or after the assembly is packaged.

As such, independent claim 1, as amended, recites a prepackaged semiconductor device assembly comprising, “a solder mask over a substrate ;a die; conductive paths connecting contacts on said die with contacts in said substrate; and, an adhesive layer which is only partially cured for adhering said die to said solder mask.”

Independent claim 12, as amended, recites a prepackaged semiconductor device assembly comprising, “a solder mask on a substrate; a die; electrical contacts on said substrate and said die, each contact on said die being connected to a respective contact on said substrate, said electrical contacts being devoid of contamination caused by outgassing from said solder mask; and, an adhesive layer which is only partially cross-linked affixing said die to said solder mask.”

Amagai relates to a semiconductor in a BGA package and the manufacturing method thereof. *See* Title. As such, it is not a prepackaged semiconductor device assembly, but is instead a packaged device. Moreover, as admitted by the Office Action, Amagai does not disclose a “partially-cured adhesive layer.” Office Action at 3. The Office Action attempts to combine

Amagai with Forray to render independent claims 1 and 12 obvious. Although the combination is improper, as discussed below, the cited references, alone or in combination, fail to meet each and every limitation of independent claims 1 and 12.

Specifically, the references, alone or in combination, fail to disclose, teach, or suggest “a prepackaged semiconductor device assembly comprising . . . an adhesive layer which is only partially cured for adhering said die to said solder mask,” as recited by claim 1. As discussed above, one of the benefits of an adhesive layer which is only partially cured is that the prepackaged semiconductor device assembly can be further processed. *See* Present Specification at 7. These processes may include wire bonding, encapsulation, solder reflow, and testing. *Id.* During these processes, the adhesive layer will be fully cured at lower temperatures as compared to conventional curing processes, such as those disclosed and used by Amagai, which results in a decrease in the number of voids and outgassing contaminants.

Forray discloses a one-step method of forming an adhesive bond at a cure peak maximum temperature no greater than about 100°C. *See* Forray at [0008]. Forray’s adhesive bond is fully cured after its one-step method. Moreover, Forray fails to disclose, teach, or suggest a prepackaged semiconductor device assembly. Accordingly, Forray, alone or in combination with Amagai, cannot disclose, teach, or suggest a prepackaged semiconductor device assembly comprising . . . an adhesive layer which is only partially cured for adhering said die to said solder mask,” as recited by claim 1.

Applicant respectfully disagrees with the Office Action’s assertion that the term “partially-cured” is a process limitation. The term “partially-cured” is a characteristic of the adhesive layer that is not fully cured, as described in the present application’s specification at page 5. The properties of the adhesive layer allow further processing of the intermediate structure; something that Forray’s adhesive cannot do.

Accordingly, Applicant respectfully submits that claim 1 is allowable over the cited references, and requests that the rejection be withdrawn.

Claims 2, 3, 6, 7, 8, 9, 11, 34, 37, 38, 39, 41, and 42 depend from claim 1, and are allowable over the cited references for at least the same reason set forth above, and on their own merits.

Claim 12 is also not rendered obvious by the cited references. As discussed above, Forray's one-step method of curing the adhesive bond results in a complete curing (or complete cross-linking) of the adhesive bond. The cited references, alone or in combination, fail to disclose, teach, or suggest a prepackaged semiconductor device assembly comprising, *inter alia*, "an adhesive layer which is only partially cross-linked affixing said die to said solder mask," as recited by claim 12.

Accordingly, Applicant respectfully submits that claim 12 is allowable over the cited references, and requests that the rejection be withdrawn.

Claims 14, 16, 17, 18, 19, 20, 36, 40, and 52 depend from claim 12, and are allowable over the cited references for at least the same reason set forth above, and on their own merits. New claim 51 also depends from claim 12, and is allowable over the cited references for at least the same reason as claim 12. Applicant respectfully requests that the rejections be withdrawn, and the claims allowed.

As discussed, above, the combination of Amagai and Forray is improper. In combining the references, the Office Action makes the simple assertion, without any evidence, that "[i]t would have been obvious to a person having ordinary skill in the art to form the adhesive of Amagai with the adhesive of Forray and its characteristics." *Id.* at 4. The Office Action has not applied the proper test for obviousness; as such, the Office Action has failed to make a *prima facie* case of obviousness.

Courts have generally recognized that a showing of a *prima facie* case of obviousness necessitates three requirements: (i) some suggestion or motivation, either in the references themselves or in the knowledge of a person of ordinary skill in the art, to modify the reference or combine the reference teachings; (ii) a reasonable expectation of success; and (iii) the prior art references must teach or suggest all claim limitations. *See e.g., In re Dembiczak*, 175 F.3d 994 (Fed. Cir. 1999); *In re Rouffet*, 149 F.3d 1350, 1355 (Fed. Cir. 1998); *Pro-Mold & Tool Co. v.*

Great Lakes Plastics, Inc., 75 F.3d 1568, 1573 (Fed. Cir. 1996); and MPEP §§ 706.02(j) and 2143 *et seq.* Furthermore, the “[t]he teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant’s disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).” MPEP §706.02(j).

In this case, the Office Action has failed to provide some suggestion or motivation, either in the references themselves or in the knowledge of a person of ordinary skill in the art, to combine the references. In addition, the Office Action has failed to show a reasonable expectation of success in combining the references as Amagai uses a three-layer laminated structure having an intermediate member. There is no evidence that the three-layer laminated structure could be replaced with Forray’s adhesive bond. Accordingly, the combination is improper.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

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Respectfully submitted,
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